

REMARKS

Reconsideration and allowance in view of the foregoing amendment and the following remarks are respectfully requested.

Claims 1-3 and 6-15 are now pending. Claims 6-7 have been withdrawn from further consideration as being drawn to a non-elected invention. Claims 8-15 have been added.

Original claims 1-3 were rejected under 35 USC 112, second paragraph, as being indefinite. The claims have been reviewed and revised above to address the matters noted by the Examiner. In this regard, claim 1 has been amended to clarify that d_0 is the magnetic gap between the housing portion and a movable core and d_1 is the air gap between facing surfaces of the housing portion and movable core including any non-magnetic layers, consistent with the schematic illustration of d_1 and d_0 in Figure 2.

Original claim 1 was rejected under 35 USC 103(a) as unpatentable over Carrillo et al. in view of Phelan. Applicant respectfully traverses this rejection.

The present invention as defined in claim 1 is characterized in that an eccentricity R between a movable core and housing portion is said to substantially satisfy $20\% \leq R \leq 60\%$, where eccentricity R is defined as $d_1/d_0 \times 100$, where d_0 is the width of the magnetic gap between magnetic portions of the housing portion and the movable core and d_1 is the air gap defined between the facing surfaces of the housing portion and movable core. With the recited structure, a side force between the movable core and the housing portion can be reduced. The invention may further be characterized in that, by getting an attracting portion saturated magnetically at 40 to 50% of the maximum value of the electric current supplied to the coil, the side force is reduced, so that the sliding resistance of the movable core is reduced, as recited in dependent claim 12. In this connection, "the maximum value of the electric current which is supplied to a coil" is, as shown in Figure 4, the value of electric current where all of the attracting portion, the housing portion and the movable core substantially get magnetically saturated.

When 50% of the maximum value of the electric current is supplied to a coil, a suitable attracting force and a side force are balanced at the attracting portion.

Anticipation under Section 102 of the Patent Act requires that a prior art reference disclose every claim element of the claimed invention. See, e.g., Orthokinetics, Inc. v. Safety Travel Chairs, Inc., 806 F.2d 1565, 1574 (Fed. Cir. 1986). While other references may be used to interpret an allegedly anticipating reference, anticipation must be found in a single reference. See, e.g., Studiengesellschaft Kohle, G.m.b.H. v. Dart Indus., Inc., 726 F.2d 724, 726-27 (Fed. Cir. 1984). The absence of any element of the claim from the cited reference negates anticipation. See, e.g., Structural Rubber Prods. Co. v. Park Rubber Co., 749 F.2d 707, 715 (Fed. Cir. 1984). Anticipation is not shown even if the differences between the claims and the prior art reference are insubstantial and the missing elements could be supplied by the knowledge of one skilled in the art. See, e.g., Structural Rubber Prods., 749 F.2d at 716-17.

In order to prove obviousness, a challenger must present prior art references which disclose the claimed subject matter of the patent/application in question. If separate prior art references each disclose separate elements of a claim, the challenger must also show some teaching, suggestion, or incentive in the prior art that would have led one of ordinary skill in the art to make the claimed combination. See, e.g., Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 297 n.24, 304-05 (Fed. Cir. 1985), cert. denied, 475 U.S. 1017 (1986). In determining obviousness, there must be some reason other than hindsight for selectively combining the prior art references to render the claimed invention obvious. See, e.g., Interconnect Planning Corp. v. Feil, 774 F.2d 1132, 1143 (Fed. Cir. 1985).

Carrillo relates to a solenoid valve wherein a stroke of a plunger 64 is obtained in proportion to the value of electric current supplied to a coil. On the other hand, according to the present invention, sliding resistance of the movable core is reduced by controlling the width of a gap between a movable core and a housing portion (claim 1)

and by controlling magnetic saturation (claim 12). Therefore, the object of Carrillo differs from that of the present invention.

Furthermore, Carrillo et al mentions only a main air gap 84 which is defined axially or linearly and a secondary air gap 86 formed radially. Carrillo does not mention a magnetic gap between a movable core and a magnetic housing portion and does not impose any limits on a ratio of magnetic and air gaps between the movable core and housing portion. Additionally, Carrillo does not disclose the thickness of his non-magnetic plunger tube so that a "magnetic" gap and an eccentricity R can not be determined from Carrillo's disclosure. Thus, Carrillo does not anticipate or render obvious the eccentricity limitation recited in applicant's independent claim 1.

Phelan includes no teaching whatsoever with regard to any ratio of magnetic and air gaps between a movable core and a housing portion and thus does not overcome the deficiencies of Carrillo. Rather, Phelan '483 relates to saturation of a transistor in an electronic circuit, intended to maximize the value of electric current supplied to the transistor in a short time. In contrast, according to the present invention, sliding resistance of a movable core is reduced by controlling the width of a gap between a movable core and a housing portion (claim 1) and controlling magnetic saturation (claim 12). Therefore, the object of Phelan differs from that of the present invention.

Further, Phelan discloses how a magnetic circuit controls the value of electric current at a time when the transistor gets saturated magnetically. However, with reference to claim 12, Phelan does not disclose that any of an attracting portion or a movable core is saturated magnetically at 40% to 50% of the maximum value of electric current which is supplied to a coil, by taking into consideration that side force increases.

Because the primary references cited by the Examiner do not teach or in any way suggest limiting the ratio of magnetic and air gaps as recited in applicant's claim 1, it is respectfully submitted that the cited references cannot properly be said to anticipate or render obvious the invention claimed.

Claims 2-5 were rejected under 35 USC 103(a) as unpatentable over Carrillo et al. in view of Phelan and further in view of Jabcon. Applicant respectfully traverses this rejection.


These claims are submitted to be patentable over Carrillo in view of Phelan for the reasons advanced above.

With regard to Jabcon, an object of Jabcon is to increase ability magnetic efficiency by using a non-magnetic member 42 which is separated from the plunger 26. On the other hand, according to the present invention, sliding resistance of the movable core is reduced by controlling the width of a gap between a movable core and a housing portion (claim 1) and by controlling magnetic saturation (claim 12). Therefore, the object of Jabcon differs from that of the present invention. Furthermore, a separate member made of non-magnetic material is used in Jabcon while each member is disposed directly on a non-magnetic layer in the present application. Therefore, the constitution of the present invention differs from that of Jabcon.

All objections and rejections having been addressed, it is respectfully submitted that the present application is in condition for allowance and an early Notice to that effect is earnestly solicited.

Respectfully submitted,

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